Chapter 12

Introduction to Forensic Medicine

"Forensic Medicine is a means that makes a dead body speak, not through the body's mouth, but through evidences observable in it." --- Author of this book.[1]

1. Concept of Forensic Medicine

Forensic medicine, often called Legal Medicine or State Medicine, is an application of the knowledge and principles of medical science for justice. It is a branch of forensic science. Autopsy report; medico-legal examination reports prepared after examination of sexual offences, wounds and injuries, custodial torture etc.; age estimation report are the examples of popularly used evidences in courts that are generated by a forensic medicine expert applying their knowledge of medicine. These evidences provide scientific clues regarding the cause, time, manner, and nature of crimes committed including but not limited to homicide, rape, domestic violence, driving under intoxication, torture, enforced disappearance, infanticide, criminal abortion, extrajudicial killings and disappearances, mass disasters and so on. Even in resolving civil disputes at court, forensic medicine is helpful. In suspicious and alleged case of death due to medical negligence, autopsy examination of deceased patient can discover whether death was due to negligence of doctor, nurse, pharmacist, hospital management or not. It is a shame, Nepalese law does not require negligently killed patient in hospital bed, to be forwarded for getting autopsy examination done for identifying the exact cause, manner and time of death. Till date, we are blindly relying on and trusting oral announcement of commercially established private hospitals' words regarding cause of patient's death in their bed. Who, how, when, what manner of negligence inflicted loss to patient or caused death of patient is to be confirmed through medico-legal examination and autopsy examination of the injured and dead patient respectively. But, the culture of performing autopsy examination of a patient's corpse who suspiciously died in hospital during treatment is yet to be institutionalized.

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[1] A dead body speaks about mode of death (homicidal/suicide/accidental), cause of death (asphyxia/electrocution/poisoning etc.), time of death and many more. Only a forensic medicine expert can minutely observe these evidences and record the same for assisting court to find truth prior to delivering justice.

Paolo Zacchia is considered as the Father of Legal Medicine. He was an Italian doctor in the 1600s who published a series of books exhausting the subject with the information available at the time. He was born in the year 1584 and died in the year 1659.[2]

What really made him to be called the father of legal medicine was his comprehensive work on the characteristics of woundsand questionable deaths.

Usually the remedy for medical negligence is civil under tort against negligent health care provider, where patient suffering loss claims compensation under Consumer Protection Act, 2075 B.S. Simply because patient died in hospital or simply because treatment could not be successful is not an indicator of medical negligence as long as doctor applied reasonable care and effort towards saving life and making treatment success. Only in rare cases of maliciously intended harm or serious disregard to life of patient, negligent physician/nurse/surgeon gets prosecuted for for criminal negligence under section 231 and section 232 of *Muluki* Criminal Code, 2074 B.S.

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[2] https://www.bigwas.com/2015/09/father-of-legal-medicine.html (Retrieved on 09-10-2020)

2. Definition of Forensic Medicine

The definitions provided in following medical literatures highlight the general understanding of forensic medicine:

1. "Forensic Medicine relates to application of medical knowledge for dispensation of justice in a Court of Law. Thus, this subject teaches a man how to use his knowledge of Anatomy, Physiology, Pathology, Medicine, Surgery, Gynecology etc., to clarify or solve legal problems or issues."[3]
2. "Forensic or legal medicine deals with application of medical knowledge to aid in the administration of justice. It is used by legal authorities for the solution of legal problems."[4]
3. "Forensic medicine is the subject concerned with the application of medical and paramedical scientific knowledge to certain branches of law, both civil and criminal. Its object is to aid the administration of justice by correlating such knowledge and applying it to purpose of law. In short, it deals with the medical aspect of law."[5]

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[3] Apurba Nandy, Principles of Forensic Science 1 (2nd ed. 2003).

[4] Dr. K.S. Narayan Reddy, The Essentials of Forensic Science and Toxicology 1 (21st ed. 2002).

[5] C.K. Parikh, Parikh's Textbook of Medical Jurisprudence, Forensic Science and Toxicology 1 (6th ed. 1999)

4. "Forensic medicine means the application of knowledge of medical and paramedical sciences for the purpose of the administration of justice in the Law Courts."[6]

5. "Forensic Legal Medicine is a branch of medicine which deals with the application of medical knowledge to the purposes of law. Its aim, which it has in common with all other sciences, is elucidation of truth, its particular field of activity is that of judicial investigation, whether in civil or in criminal cases"[7]

6. Merriam Webster's Medical Dictionary defines forensic medicine as a science that deals with the relation and application of medical facts to legal problems.

These definitions show different authors have tried to define forensic medicine in their own way. Each definitions highlight on certain aspect of forensic medicine. Taking into consideration this reality, the author hereby proposes a comprehensive definition of forensic medicine as: "*Forensic medicine is a unique branch of forensic science concerned with medico-legal examination of living and dead, intended to extract clues that will serve as evidence for courts to deliver justice, both in criminal and civil cases.*"

Whatever be the definition, forensic medicine is a branch of knowledge that involves multidisciplinary subjects of law and medicine. It involves application of medical and paramedical knowledge, principles, skill and expertise for the purpose of dispensation of justice in the courtroom. It assists court to clarify facts and issues by application of scientific medical knowledge. Forensic medicine itself is a broad subject. It involves many sectors and courts take help from experts of these sectors to settle legal disputes concerned with that particular field of forensic medicine. For example- autopsy expert, forensic psychiatry expert, forensic odontology expert, forensic toxicology expert and so on.

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[6] Prof. R.K. Sharma, Fundamentals of Forensic Science and Toxicology (Medical Jurisprudence) 2.

[7] Moitra & Kaushal, Medical Jurisprudence and Toxicology 2 (2nd

3. Significance of Forensic Medicine

Dead body itself is physical evidence and medico-legal examination of such dead body performed in course of autopsy examination renders Autopsy report. This autopsy report is an example of forensic evidence produced through the application of knowledge and skills of forensic medicine. Other examples of forensic evidence includes medico legal examination report of rape victim, examination of wounds and injuries, viscera examination report, drunkenness examination report, age estimation report, DNA examination report and so on. The following facts help to highlight the usefulness of forensic evidence in the administration of justice:

a) Forensic evidences are highly scientific and objective unlike confessions and witness evidences. Confession may be exacted by inflicting torture and witnesses may be purchased in money, may turn bias, may loose memory in course of time however forensic evidence are scientific, objective and reliable and never tell a tale.

b) Forensic medicine is helpful in differentiating accidental, suicidal and homicidal death or injuries.

c) Application of forensic medicine helps to protect human rights of accused.

d) Use of forensic evidences in court helps to establish guilt beyond reasonable doubt.

e) Forensic practice establishes paternity or maternity through DNA examination.

f) Forensic evidences connect a criminal to the crime committed.

g) It contributes in strengthening justice delivery system by making it more scientific, competent and objective.

h) Forensic oriented prosecution founded on scientific evidence increases efficiency of prosecutor. The failure or success rate of prosecution directly depends upon how strong and credible evidences have been submitted to court for trial. Forensic evidences, when corroborated with other circumstantial evidences are highly reliable and best evidence till the day.

i) In sudden, suspicious and unexpected death, post mortem examination may find out the medical cause of death and trace any foul play.

4. Scope or Fields of Forensic Medicine

Forensic medicine concerns any areas of medicine that interact with law and justice. A large number of areas of medicines have potential forensic implication. The scope or field of forensic medicine is so broad that perhaps it is unique in medicine. No single forensic practitioner can have any realistic hope of claiming to be an expert in all aspects of this diverse specialty.

a) Forensic pathology: While clinical medicine serves patients; forensic pathology serves the state to find out why its citizens died. Being involved in investigating possible crime is very different from treating patients. Medicine has developed quite a strong evidence base to its practice, and this has not been mirrored to the same extent in forensic pathology. The massive expansion in the size of the knowledge base of medicine has had implications for forensic pathology. Forensic pathology is a very small operational medical specialty.[8]

b) Forensic pathologist is responsible to estimate the cause of death, manner of death and time of death of a person through autopsy or post mortem examination in sudden, suspicious and traumatic death. Forensic pathologists are also licensed doctors especially trained to examine dead bodies. The forensic pathology examines body, tissue, organs, fluids and human cells from those who died violently or suddenly. The report prepared by the forensic pathology helps to estimate cause and manner of death such as suicide, homicide, natural cause, drowning or severe hemorrhage etc.

c) Clinical forensic medicine: This branch of forensic medicine covers large area of medical specialty that interacts with law, judiciary and the police involving living person or even dead bodies. It includes medico legal examination of offence of sexual assault, wounds and injuries in case of hurt, level of intoxication, estimation of age of a child, assessment of physical disabilities etc. It provides an independent expert opinion through scientific examination of different medical facts involved in justice delivery.

d) Forensic toxicology: Toxicology is a science of poisons that study the poisonous quality, chemical composition and effects on an organism. Forensic toxicology involves the detection and interpretation of the presence of drugs and other potential toxic compounds in bodily tissues and fluids. Forensic toxicologist assists in criminal investigation through examination of body fluids and tissue samples collected and forwarded by investigator. This branch of forensic science helps to investigate poisoning case. Therefore, it deals with sources, characters, properties of poison, the symptoms they produce, their fatal effects, and remedial measures that should be taken to combat their actions.

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[8] Stephen Cordner, Jonathon Ehsani, Lyndal Bugeja, & Joseph Ibrahim; Pediatric Forensic Pathology: Limits and Controversies, Victorian Institute of Forensic Medicine November 2007 (https://www.attorneygeneral.jus.gov.on.ca/inquiries/goudge/policy_research/pdf/Limits_and_Controversies-CORDNER.pdf Retrived: 2020-09-19)

e) **Forensic thantology:** This branch is a scientific investigation of death. It investigates the mechanisms and forensic aspects of death such as bodily changes that accompany to death and the post mortem period changes. It deals with different causes and modes of death and their medico-legal significance.

f) **Forensic odontology or Forensic dentistry:** This branch of forensic medicine deals with teeth and bite mark. It contributes to estimate age of a person and identify suspect(s) of crime. Odontologists use dental science to identify unknown human remains, compare bite marks and conduct dental profile. Report prepared by odontologist after scientific examination of teeth and teeth mark could help judge to determine the issue presented before bench.

g) **Forensic psychiatry:** This field of forensic science deals with issues arising in interaction between psychiatry and laws. A forensic psychiatrist examines personality disorder of a person, mental illness of an accused or mental torture inflicted upon a person under custody or prisoner in jail. Penal system of each country differently treats mentally retarded offender. Mental torture inflicted by the state official to any person in either custody or jail is a criminal offence and the victim is entitled to compensation in addition to criminal liability for torturer. Therefore, it is valuable branch if forensic science. Though the number of mental health patients is increasing in Nepal, lack of a comprehensive and specific statute to address mental health is unfortunate.

i) Forensic anthropology: Forensic anthropology deals with physical and biological concern to legal process. Physical and biological examination of human skull, skeleton, bones and other biological and physical features help criminal justice system through personal identification. Determination of age, sex, stature, ancestry and unique features of a skeleton is important when police finds skeleton remains or unidentified body. Thus, this branch assists in the identification of deceased individuals whose remains are decomposed, burned, mutilated or otherwise unrecognizable.

i) Forensic entomology: This branch of forensic medicine studies insect and their arthropod relatives that inhabit decomposing remains. The presence, expansion and development of insect in dead body provide information regarding time of death and level of decomposition. This field is helpful in determining the post mortem interval and location of a death in question. Besides post mortem intervals, this branch has other applications including geographic origins, movement of the body remains, traffic and transportation of accidents and the detection of abuse in children and neglect of the elderly.

i) Forensic serology: This branch refers to study and application of human body fluids such as blood, semen, saliva, urine, sweat etc. Extraction of cells from human body fluids and the way they assist in DNA examination is very much important in criminal justice system. It assists in detection, classification and study of various bodily fluids and their relationship to a crime scene.

k) **Forensic nurses:** Forensic nurses are specially trained having skill in observation, documentation and preservation of evidence. Nurses collect evidence from perpetrators and survivors of violent crime and carry toxicological tests. Managing medical records, testifying in court and providing comfort to crime victims also fall under the responsibility of such nurses. These nurses are specialized in fields like trauma and sex-related crimes.

5. Personal Identification

Identification is a process of recognizing someone or something. It is based on principle of uniqueness that each person or object carries a unique physical character and differs from other. Uniqueness or individuality of a person can be identified based on certain physical characteristics. It is helpful in both civil and criminal cases. It differentiates a person from another person. Identification is necessary for living person, recently dead person, decomposed bodies, mutilated body parts and skeleton. Generally, it is said that a doctor must notice at least two identification marks while examining medico legal cases.

Identification plays a big role in criminal investigation and it is the job of police to recognize the person, who has committed the alleged offence. However, police personnel may not be expert in all technique and methods of identification. Sometimes, forensic test is a must to compare individual character for the purpose of confirmation. Thus, they may seek help of concerned experts.

It would be great injustice if courts begin to deliver verdict without confirming the identity of person involved in the case. An innocent person may be judicially hanged if judgment is executed to wrong person. Similarly, person may be caused to bear burden, perform duties and bear liability even if the person has nothing to do with the issue dealt by court. Thus, identification of person or determination of individuality of person is necessary. For instance, Mr. X might be charged and be wrongfully convicted for sexual assault committed by Mr. Y unless personal identification of the exact person involved in the sexual assault is identified.

Identification is required of both living human being and dead. In civil cases such as share on partition property, establishment of relationship, insurance claim, pension, inheritance, marriage, disputed sex, disappearance of person etc. need identification of person before incurring rights and duties on person. In criminal case such as homicide, rape, absconding criminals, assault, grievous hurt, enforced disappearance, mass destruction in bomb explosion or terrorist attack etc. there arises need to determine individuality of person.

Identification or procedure of individualization is broadly of two types:

A. General Identification (Partial Identification)

B. Personal Positive Identification (Complete Identification)

1. General (Partial) Identification

General or partial identification can not exactly pinpoint who exactly is the criminal or victim but to a large extent helps to narrow down further criminal investigation by giving general clues or hints towards discovering who might be the person. General identification though not sufficient for exact fixation of individuality of a person, it is significant as it records certain information or data that will ultimately help complete identification. Though this is often called 'incomplete identification', it guides investigation towards searching truth. The data or information that help in general identification are:

A) Race

Race refers groups of population who share common physical traits. Imminent writers point- three broad categories of race in the world are easily recognized. They are:

a. Caucasoids: It includes people of European origin. Caucasoids have traits such as thin and fair skin; blue or grey iris; reddish scalp hair, raised forehead etc.

b. Mongoloids: People of China, Japan and in Nepal- Sherpa, Thakali, Bhote etc. belong to this race. Mongoloids have traits such as yellowish or pale skin; black iris; black, straight and wavy hair, inclined forehead; larger flattened face etc.

c. Negroids: Black people or people of African origin are categorized under this group. They have common traits such as black and tough skin; black iris; black, curly or wooly scalp hair; small and compressed forehead; oblique teeth; proportionately longer forearm than arm etc.

[Human Skulls Diversity Based on Race : *See figure 12.1 in figure section]*

Morphological features of Nepalese: Morphological feature could be articulated on Nepalese people to determine third general identity. For instance, most people of mountain region have short face with black iris, thin hair and pale skin colour. Generally, their race falls under Mongoloids. People of terai region may have black skin colour, a long height, long black hair and inclined forehead than people of mountain region. People of hilly region have fair skin, black scalp hair.

Race was widely recognized as a data for personal information previously but these days, with numerous national and international legal standards that discourage racism, and culture of cross-culture marriage, it is less emphasized in modern medical practice. However, it still has some degree of evidential value.

B) Religion

Religious marks, religious ornaments, clothing etc. are helpful to identify individuality of a person where identity is in question. Thorough examination of living person or dead body may indicate the person's religion.

Hindu males are not circumcised. They wear sacred thread (*janai),* use necklace of wooden bead in neck or stone ring or god marked ring in finger, color mark on forehead (*tika),* wooden sandal or tuft of hair. Muslim males are circumcised. There may be callosities over lateral malleolus of their left leg and on their forehead due to regular practice of Namaz. Their clothing may also determine their religion.

Hindu female may use vermilion (*sindur)* on head; silver toe ring, necklace and nose ring in left nostril etc. Muslim females do not use vermilion on head. They may have nose ring aperture in septum only. Several openings in the ears along helix may be found.

C) Age

Estimation of the age of living person is necessary for various purposes including determination of criminal liability to be imposed. This is mostly used to determine whether the suspect is a juvenile or adult. Determination of age is equally important where unidentified, decomposed or mutilated body is found. Estimation of age of such dead body leads to further investigation of the crime and links information regarding missing person reported to police office.

There are several techniques of estimating age of person. Technique of estimating age of foetus, child, and young person are different. Age of a person in postnatal life can be estimated from: (a) Physical or morphological features, (b) Laboratory test, (c) Teeth, and (d) Ossification activities and growth of bones.

Age estimation cannot be conclusive and exact because the error chances of age could be up to 2 years in plus or minus. Therefore, it is properly called 'age estimation' rather than 'age determination'. If a doctor after examination prepares age estimation report stating- 'the age of examined defendant is 19 years with plus minus 2 years' then the benefit of doubt should go to accused and court has to treat such defendant as a child of 17 years and mitigate sentence after conviction for delinquency in accordance to the spirit of Nepalese Children's Act, 2075 B.S.

Annex 13 of Nepalese Crime Investigation Regulation, 2075 B.S. provides a uniform legal format to be filled by medico-legal expert while executing Age Estimation Report. The law requires age estimation examination should be conducted by forensic expert as far as possible or even by a trained doctor. Particulars of the report are to be filled by the examining expert or doctor oneself in understanding handwriting. The report should include following particulars:

1) General details of examinee: Name, code name of examinee, alleged's age and sex, address, identical marks present on body (if any), name of person who brought or identifies the examinee, written consent of the examinee to examine. In case of age estimation of minor, guardian's consent is required.

2) General physique and development: Height; weight; nature of voice; adam's apple; colour and length of scalp hair; presence/absent, colour, length and distribution of moustaches, beards, auxiliary hairs and pubic hairs; presence of any abnormality and disease (if any). In case

examinee is female the information such as breast devolvement, time of beginning of menstruation are to be included. Information regarding mental state and dental development are to be recorded.

This part deals with study of morphological features and eruption of teeth of the examinee. Under morphological features, visible characteristics of the examinee are studied. Under teeth development, type of dentition and number of teeth are studied. Counting of temporary teeth, condition of presence or combination of deciduous and permanent teeth and complete fall of temporary teeth etc. are the factors that help to estimate the age of examinee.

3) X-ray examination: Use of ossification technique is also prescribed in the format. X-ray examination is recommended to examine age of the examinee. Inspection of right elbow Anterior/Posterior (A/P) and lateral view; right wrist with hand A/P view and pelvis A/P view are prescribed.

4) Other parts of body: For the purpose of estimating age of examinee, the examiner may conduct x-ray of other body parts of examinee. It may be done if above mentioned methods and inspection could not provide adequate information to examiner to estimate the age properly.

Medico legal importance of age

a) In case of commission of delinquency by any children, the degree of criminal liability depends on age factor.[9] Thus, courts need to determine exact age of juvenile before sentencing. Accordingly, minor below 10 years of age are presumed unable to form *mens rea* and thus are completely immune from criminal liability. Minor can not commit crime, they only commit juvenile delinquency. These young people are considered not criminals, but as children in conflict with law.

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[9] Section 36 of Nepalese Children's Act, 2018 (2075 B.S.).

Criminal Liability of Minor		
Age of:	Age	Liability
Complete Innocence	Below 10 years	No Liability
Partial Liability	10 – below 14	Fineable offence: Release by counselling. Punishable Offence: Up to 6 months in prison or up to 1year in Child Reform Home (depending on case)
Half Liability	14 – below 16	Half punishment of adult
Two Third Liability	16- below 18	Two third punishment of adult

b) Tender age may be a factor to mitigate punishment.[10]

c) Consent by girl below 18 for sexual intercourse is invalid.[11] Therefore, age determination is essential to decide whether the girl consenting to have sex is major or minor. If she is major, it will not be an offence of rape.

d) Victim's age directly affects the degree of punishment imposed on defendant in rape offence ranging from minimum of 7-10 years (to girl of 18 years or above) to maximum life imprisonment (to minor below 10, completely disable, to women above 70 years).[12]

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[10] Section 36 of Children's Act, 2075 B.S. and Section 39(a) of Muluki Criminal Code, 2074 B.S.

[11] Section 219 (2) of *Muluki* Criminal Code, 2074 B.S.

e) Age determines child marriage: Marriage shall not be celebrated unless both male and female have completed the age of 20 years.[13] Thus, determination of age of bride and bridegroom is the factor determining child marriage, underage marriage and valid marriage.

f) A minor below 18 years does not have capacity to conclude a contract.[14]Therefore, there is no validity of a contract concluded with minor. No one can bind a minor to perform contractual liability under the contract concluded at the age of minority.

g) Children who have not completed the age of 14 years should not be engaged in any labor work nor can child be forced to work without child's free will.[15] This Act has completely criminalized an act of engaging a child below 14 years as labour. Thus, determination of age of minor who is engaged as labour is important to prevent, prosecute, convicts and sentence for charge of child labour.

h) In case anyone commits offence of enforced disappearance against minor or women, perpetrator is liable for additional two years punishment.[16] Hence, age factor of victim of in certain offences determines culpability to perpetrator.

i) Age of fetus determines the degree of culpability of person who causes to abort fetus by coercing, threatening or

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[12] Ibid at Section 219 (3).
[13] Id at Section 173 (1).
[14] Section 506(1)a of *Muluki* Civil Code, 2074 B.S.
[15] Child Labour (Prohibition and Regulation) Act, 2056, sec 3
[16] Section 206 (8) of *Muluki* Criminal Code, 2074 B.S.

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unduly influencing pregnant woman.[17]

In case of uncertainty of child's age, law [18] prescribes following evidences to be entertained in descending order of priority: (a) Date of Birth (DoB) recorded in Hospital issued Birth certificate, (b) DoB issued by Local Registrar, (c) DoB Recorded in school admission or character certificate, (d) DoB issued by Medical expert after medical examination of child, and (e) DoB mentioned in horoscope or that mentioned by family members.

Supreme court in *Sunil Kumar Rishidev Sadha* case[19] held-primary evidence to be considered while determining age of victim at the time of offence is to rely on date or year as recorded in 'Birth registration' or 'school admission' in case of non-availability of former.

Age estimation has certain limitations that could be beneficial for defense lawyer during cross-examination. Pre-existing illnesses can lead to a developmental delay and thus to an underestimation of age, which in legal terms has no adverse consequences for the person concerned. However, it is critical to avoid overestimating age due to disorders that accelerate development. Such disorders are infrequent, but include especially endocrine disorders, which can affect not only adult height and sexual maturation, but also the skeletal maturation. Endocrine disorders that lead to accelerated skeletal maturity include: (a) Precocious puberty, (b) Adrenogenital syndrome, (c) Hyperthyroidism. Physical examinations should therefore take into account symptoms of hormonal development acceleration, such as gigantism, acromegaly, dwarfism, virilization in girls, dissociated virilism in boys, goiter, or exophthalmos. No age assessment can be made in about 1% of cases, due to abnormalities in either the medical history or the physical examination. Most often, evidence of hyperthyroidism is found, which may then require further diagnostic evaluation.[20]

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[17] Section 188(3) of *Muluki* Criminal Code, 2074 B.S.

[18] Section 83(d) of Children's Act, 2075 B.S.

[19] *GoN* v. *Sunil Kumar Rishidev Sadha*, NKP 2076 V 6, (Rape) DN 10291.

A doctor giving mere opinion about age of girl to be between 14 and 15 years is not enough. Such opinion has to be based on scientific logic and reasons. The confirmative test for age estimation is ossification, for which x-ray of bones is inevitable. Opinion given by doctor without doing x-ray examination but simply by measuring height, weight, width, and observing dental features, are same like opinion given by layman and hence such opinion given by doctor cannot be considered as expert opinion carrying evidential value.[21]

If a person mentions different age in different records, Supreme Court in *Satya Dev Yadav* case decided- the age estimated by hospital's board of medical doctors is to be considered as actual age of such person.[22]

Objection over age is to be raised at district court. Suspicion or objection raised at the level of appellate court regarding age has not been accepted by court in *Dilliram Karki* case.[23]

D) Sex

Sometimes only limbs or skull are found in scene of crime. From that, investigators need to identify who that belongs to. It could be victim of crime as well. There comes relevancy of sex determination of the limb or skull and then trace identity regarding whom the particular person it belongs to. Sex based abortion being crime, it is necessary to determine sex of aborted fetus prior to prosecution.

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[20] Andreas Schmeling, Reinhard Dettmeyer, Ernst Rudolf, Volker Vieth, Gunther Geserick; Forensic Age Estimation: Methods, Certainty, and the Law; Dtsch Arztebl Int. 2016 Jan; 113(4): 44–50. Published online 2016 Jan 29. (Accessed: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4760148/; September 12, 2020)

[21] Raju V.B. (1973), Commentaries, The Indian Evidence Act, 1872, 3rd Edn., (Volume I) P. 553

[22] *Satya Dev Yadav* v. *Gena Lal*; *Jalsajhi*, NKP 2026 V 1 FB DN 482 P 170

[23] *Dilliram Karki* v. *HMG*, *Nakabajani* Theft and Arson, SC Bulletin 2057 V 4 P 11

Sex determination involves numerous medico-legal importance. It helps to solve numerous legal questions, both criminal and civil. Disputes on succession, inheritance, marriage, divorce, legitimacy, impotence, rape etc. need sex determination.

Sex of a person can be determined from physical morphology, bones, microscopic study of sex chromatins in cell and gonadal biopsy etc. This type of technique to determine sex may not be appropriate in cases of intersex or in chromosomal abnormalities.

Some physical morphological features helpful in determining sex can be tabulated as:

Basis	Male	Female
Built	Large and strong muscles	Smaller and weak muscles
Shoulder	Border than hip	Narrower than hip
Waist	Ill designed	Well defined
Limbs	Longer	Shorter
Skull	Square in shape	Round in shape
Thigh	Cylindrical	Conical
Skeletal weight	4.5 kg	2.75 kg
Skull capacity	1500-1550 cc	1360-1400cc
Teeth	Larger	Smaller
Voice	Hoarse after	Soft

	puberty	
Pubic hair	Thicker, coarser, extends upwards with apex at umbilicus	Thinner, finer, does not extend upward, triangular in distribution with baseline at mons veneris
Hair on other parts of body	Grow over chest, limb and other parts	No significant growth of hair on other parts

The microscopic examination of sex chromatin present in human cell also helps in sex determination through finding of XY chromosomes in male and XX chromosomes in female. However, when a person is born with mosaic genetics, some of her cells have XX chromosomes and some of them have XY.[24]

E) Stature/ Height

Stature is also called height and is helpful in general identification of person. Height of a person varies at different times of the day. Height reduces in the afternoon and evening due to the reduced elasticity of the intervertebral discs and the longitudinal vertebral muscles.[25]

There are number of factors leading to reduction of person's height such as malnutrition, growing age etc. The body height of a dead person also decrease about 2 cm.

Besides abovementioned factors for general identification, other factors such as clothes, general development, body built, complexion, features of hair, birth marks, colour of teeth, tattoo marks etc. are also important to determine individuality of a person.

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[24] https://isna.org/faq/what_is_intersex/

[25] Dr. K.S. Nararan Reddy, The Essentials of Forensic Science and Toxicology 70 (21st ed. 2002).

2) Personal Positive or Complete Identification

Complete identification refers exact fixation of questioned person's identity. Through these factors, identity of a particular person can be pin pointed or confirmed exactly. Factors relevant in personal positive identification are:

A. Scar: An injury to the dermis produces scar. It relies on principle of uniqueness because of number, shape, size, smoothness, irregularity of surface, presence of tendencies and color etc. It indicates the types of injury e.g.- incised wound, stab wound, lacerated wound, punctured wound, burn wound, electrocution wound etc. Size of scars grow with natural growth. There are two types of scar- temporary and permanent.

   Medico legal importance of scar include- (a) Identification of person, (b) Shapes of scar indicates the weapon used, (c) Age of scar helps in criminal offence, (d) Helps in identification of fake cases, (e) Nature of hurt can be determined.

B. Tattoo mark: Person implants tattoo marks at different sites of own body as per their preference or choice. The colour, and designs used in tattoo is very helpful in identification of not just person but also the mind state and attitude of the person. Tattoo marks are permanent in nature.

   Tattoo marks have numerous medico legal importance. These include: (a) They are useful in identification of person, (b) useful in religion identification and god of worship, (c) conveys psychological status of person, (d) indicates social status, (e) reflect travel, history, war, occupation sex, interest etc.

C. Wounds: Human body may be inflicted with wounds due to

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to numerous reasons. Criminal *actus reus* of accused may also lead external and internal wounds to a person. For instance wounds of stab, accident etc. Defensive wounds and injury on the body connects suspected criminal with a given crime. Dust particles, pieces of glass found in flesh etc are important in maintaining chain of custody and in relating *corpus delicti.*

D. Disease: "The findings of disease are helpful. The unidentified body should be checked for amputations, body deformities, enlarged joints of the finger due to arthritis, immovable joints due to disease, bowed legs and curvature of the spine. Autopsy of the dead body reveals presence of any disease such as diabetes, AIDS etc. Thus presence of or even absence of disease itself could be a factor helpful in identifying some particular person.

E. Stains: Blood stains found on accused's body or cloth if matches with victim's blood, they both are connected to crime scene. Stains of blood, paints or other colour are useful in investigation of crime. For instance, if DNA test of victim's blood matches with red stains collected from assailant, connection between victim and assailant is established.

F. Occupational Marks: Special kind of occupational marks are present in body of a person who belong to particular occupation. Deposition of dust or soil inside fingernail may be common to farmers.

Painter may have stains of colour on his body skin or his clothes. Miller's body may contain dust of flour. Manual workers hands are usually horny and rough. These all are occupational marks and assist to identify offender in criminal case.

G. Complexion and Features: Victim's skin color or dead body's skin color or even skin color of perpetrator are helpful in personal identification of victim, deceased, and perpetrator respectively. Complexion of a person may be fair, wheat coloured, and dark, pale brown or pale yellow. Some cleaver criminal may change their complexion through plastic surgery. Individual features such as colour and shape, eyes, lips, chin etc should be studied in detail. These features of an individual may be changed due to some disease, manner and habit etc. Example- teeth color may be changed after habit of tobacco, *khaini, ghutkha* or *paan* intake. Thus, caution must be taken during identifying a person on the basis of complexion and features.

H. Eyes: Eyes are good personal positive identification characteristics. It is said that an iris pattern of a person is unique and it does not resemblance to other person's iris pattern, same like fingerprints. Examination of factors such as whether eyes are artificial or natural; absence of one or both eyes; shape; color of iris etc. may be important record to determine individuality of a person. Presence of proptosis (protrusion of eyeball), congestion or petechial haemorrhage on eyes at autopsy indicate sign of asphyxia.

I. Hair: Chapter 6.2 has made detail discussion about hair evidence. Hair is important trace evidence helpful in criminal investigation. In rape offence, presence of foreign pubic hair at private parts of victim and perpetrator, resemblance of DNA test finding conducted from such pubic hair, is best evidence to constitute commission of crime. Sometimes dead victim's hand may grasp some hair of perpetrator. Knob of weapon may also hook some hair of victim. By examining such hair and by examining DNA collected from such hair bulb, personal positive identification is possible.

J. Teeth: Structure, shape, colour and number of teeths are unique and thus useful in identification. Number of teeth erupted and number of unerupted teeth, number of permanent teeth and number of temporary / milk teeth, situation of fallen teeth etc. are unique teeth patterns helpful in personal identification.

The medico-legal importance of teeth include:

i. Caste determination

ii. Sex identification

iii. Occupational marks on teeth is helpful in personal identification of some people

iv. Blood group of a person can be identified through examination of pulp tissue in teeth.

v. Personal positive identification could be possible through examination of gap between two teeth, number of tooth, fallen tooth, broken tooth, situation of gum, cavity, inclination of tooth, overlapping of teeth, dirt in tooth, artificial teeth, and metallic installation in teeth.

vi. Helps to identify habit such as cigarette smoking, tobacco consumption, betal leaf (*paan*) eating and so on.

vii. Teeth remain safe even if dead body is extremely decomposed or body is seriously burnt.

viii. In air traffic accident and building arson where multiple persons die, situation of teeth and artificial teeth are helpful in personal positive identification.

ix. In case of death of person due to heavy metallic poisons such as arsenic and mercury, these elements are detected in teeth of deceased even after long time of death.

x. In case of accused biting victim or any food items, identification of accused may be possible through examination and matching of teeth pattern left on bitten object. If the accused is secretor, even blood group of accused can be traced by examining saliva left by accused during bite.

xi. A person may sometimes die due to accidental swallowing of artificial teeth.

K. Bite marks: When a person bites someone or something, the person's teeth pattern gets implanted or transferred at bite site as bite mark. Alignment of teeth of an individual is peculiar to another. Victim may bite the perpetrator in defense, food stuff half eaten and left to the scene of crime etc. may create link between crime and perpetrator. Thus, careful recording and study of available bite mark is important. Bite mark may be studied through photographic method or through charting of teeth.

L. Finger print and foot print: Finger prints and foot prints are unique for every person and this uniqueness make them basis for personal positive identification. Details about fingerprint has already been discussed in chapter 3.

M. Habits and Traits: Individual may have unique habit, manner and traits. For instance, habit of automatic eye blinking or teasing while talking to other; jerking of shoulder involuntarily; smelling water before drinking etc. are helpful in fixation of individuality of person.

N. Pocket particles: Pocket particles found with dead body or with incommunicado person may be helpful to determine name, address, nationality, religion etc of the person. These particles help in personal positive identification.

O. Clothes and ornaments: Clothes and ornaments used by a person may be useful in determining social status of person.

Value of clothes or ornaments and their brand (trademark) reveals economic position of the person. Colour of and types of clothes been worn by missing person may be helpful in identification. Stain present in the clothes helps to guess occupation of person. In mass disaster such as air crash, explosive attack etc, clothes and ornaments worn by person are very important to establish identity of victims if they cannot be identified by face appearance.

P. Signature and Handwriting: Signature and handwriting of a person bear peculiar character that make it unique from others. Details have been discussed in chapter 8. Signature analyst analyzes two signatures of person through number of grounds and provide affirmative or negative result. Different writing habit, size, space, movement of line, pressure of ball of the pen on paper etc. are some grounds to examine and compare two different writings and determine individuality of a handwriting. This differentiates signature and handwriting of a particular person from others. Thus, it is useful data or factor for personal positive identification.

Q. Speech and voice: Certain qualities of voice of a person are important. Peculiarities on speech such as stammering, structuring, lisping and nasal twang become more evident when the individual is talking excitedly.[26] Recording of voice is useful in identification. Advanced technology developed is applied to study voice system that helps in criminal investigation. No two voices are completely alike. Call tapping of persons is done under it.

6. Legal Provisions Relating to Forensic

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[26] Dr. K.S. Nararan Reddy, The Essentials of Forensic Science and Toxicology 84 (21st ed. 2002).

Medicine in Nepal

Provisions related to forensic medicine are scattered in numerous prevailing laws of Nepal. These major laws include:

1) Muluki Criminal Procedure Code, 2074 B.S.

Section 20 mentions, investigating authority after completing dead body examination inventory has duty to send corpse for autopsy examination to a government medical doctor or to an expert designated in that behalf by the Government of Nepal or to a licensed medical doctor, at government expenses. If autopsy could not be possible due to decay, investigator has to execute a deed stating the same matter in the presence of local distinguished persons. But, if, in spite of corpse being decayed, there is possibility to find cause of death by any other scientific examination, it is to be performed. Post mortem could also be conducted by a team of experts in order to find out cause of death. Previously, laws were not clear regarding possibility of carrying such scientific examination in case of decayed corpse as well as regarding the possibility of expert team involvement in such examination. That ambiguous legal vacuum has now been addressed by the Code. Schedule 15 of the Code provides format of autopsy report.

Section 21 has provision for the examination of physical evidences such as blood, semen, hair or other part of body, arms, thing, object, DNA or any other physical evidence. Such evidences are to be conducted by a government medical doctor or a recognized laboratory.

Section 22 mandates medico-legal examination of wounds and injuries to be done through government doctor or health worker. Schedule 16 of the Code provides format of Injury Examination Report. This format is used even in case of examination of detainee.

Section 23 is a new provision allowing investigating authority to take support of any expert in course of investigation has been introduced by the Code in this section. Such expert is paid and has duty to support investigator when support is requested.

Prior to Section 102, Nepalese law was silent what to do in case of death of expert. Currently, this section has clarified that in case of death or inability of opining expert to attend at court, the examination of another equal status expert witness is to be done.

Before the provision of Section 113, there was no clear and specific law to provide allowance to expert witness but after the introduction of this section of the Code, expert witnesses currently are entitled to daily allowance, travel allowance and security. The concerned police office has duty to provide witnesses who appear before the court, on behalf of the Government of Nepal, in any cases listed in Schedule-1 or Schedule-2 with such daily and travel allowance as is receivable by the non-gazetted first class government employee and for expert witness with that of receivable by the gazetted third class officer under the prevailing laws.

2) Muluki Criminal Procedure Regulation, 2075 B.S.

Rule 8 allows court authority to issue decree for causing to do bodily examination of following persons in following situations- where a person is presented before court seeking permission to keep in custody, where custodian oneself or anybody on his behalf has applied to get bodily examination showing reasonable ground of discovering proof of custodial torture, where court is informed about need of bodily examination because of any other reason. The concerned hospital has duty to forward such examination report within 3 days through investigating authority and the report is to be attached in case file.

Rule 9 confers power on court to recommend for departmental action against investigator who tortured custodian, along with order for carrying required medical treatment of victim custodian, and order to provide interim relief amount to such custodian.

3) Crime Investigation Regulation, 2075 B.S.

Rule 14 aims at torture prevention through bodily examination of accused in course of interrogation prior to and after detention through government doctor as far as possible or through authorized doctor.

Rule 22 provides that audio-visual enquiry or statement of witness {disable/insecure} has to be recorded in pendrive or CD for re-listening, watching, reading; statement in police can be recorded in audio-visual mode; it is duty to concerned authority to store such certified record so as to prevent anyone from tampering it.

Rule 23 requires concerned police office to bear expenses for autopsy.

Rule 24 imposes duty on examining doctor or lab to immediately forward examination report back to concerned police office after filling all legally required information as prescribed in various annexes:

1. Medico-legal examination of female subject in sexual offence (Annex 11)
2. Medico-legal examination of male subject in sexual offence (Annex 12)
3. Age Estimation Report (Annex 13)

4. Intoxication/Drunkenness Examination Report (Annex 14)
5. Consent of DNA giver for examination (Annex 15) [Investigation officer may forward for scientific or DNA examination of concerned body if deems necessary believing it could give significant evidence related to crime.]
6. Forensic Examination Report of Lab (Annex 16) [for any exhibit]
7. A Examination Report (Annex 17)

The detail columns and data to be filled by examining expert has been legally determined. This helps in uniformity in report through the country. Besides, following legal guidelines have been issued while filling these reports by experts:

i. Examination is to be performed by experts of forensic science as far as possible. If impossible, examination could be done even by doctor trained in forensics.

ii. The examining expert or doctor ownself has to prepare the report.

iii. Report has to be in computer typed format as far as possible. If not possible, the contents of report must be mentioned in a clearly understandable manner. The original copy of examination is to be attached together with report.

iv. Extra page can be used if the detail information could not be adjusted in the limited space given in the standard format of the annexes.

4) Evidence Act, 2031 B.S.

Section 13A introduced by second amendment to Evidence Act, 2031 B.S.[27] recognizes items recorded in audio-visual electronic forms can be taken as evidence.

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[27] Published in Gazette dated 2077/02/20 (Khanda 70, Atriktanka 10).

Section 18 of the Act provides two exceptional situations in which expert opinions can be considered as direct evidence even if experts do not attend the court to testify opinion. Undisputed autopsy report and opinion expressed in an expert's book or article kept under public sale are these two exceptions.

Section 23 defines expert. Accordingly, if a person acquires specific knowledge in the area of foreign law, science, arts, signature or fingerprint through special study, training or experience, the person is considered as expert and such expert's opinion is admissible as evidence before court.

In section 35(1), an explanation clause has been added by second amendment to Evidence Act, 2031 B.S.,[28] according to which "document" denotes anything kept in digital or electronic record.

Section 52 deals about examination-in-chief and cross examination of expert. Accordingly, when it is necessary to reach to the conclusion regarding any fact relating to signature, finger impression, law of a foreign country, science, custom-tradition, art or any other similar subject, the court may cause to appear, the person who deserves special expertise, experience or training and examine him/her as a witness. In case an expert witness is so examined by the court, it has to provide opportunity to the parties to the case for cross examination of such witness in accordance to the Act.

5) Police Act, 2012 B.S.

Section 22A of the Act provides that when a Police Office has found a dead body of a person died due to accident or by committing suicide or any other suspicious circumstances, no dead body shall be handed to medical institute or relatives without completing investigations including post mortem examination in according to law. If the police officer finds unknown deceased died naturally, it may hand over such corpse to medical college for study purpose or may arrange to cremate through the Local Village Development Committee or Municipality or social organization.

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[28] Published in Gazette dated 2077/02/20 (Khanda 70, Atriktanka 10).

6) *Muluki* Criminal Code, 2074 B.S.

This statute does not have specific section that expressly mentions relevancy of forensic science in justice administration. However, there are numerous crimes in which forensic examination report becomes significant for conviction by court. These crimes include but are not limited to- abortion, malafide investigation and prosecution, hurt, adulteration in food and drugs, age estimation in rape and in child marriage, acid or chemical or corrosive attack, counterfeiting of coins and currency notes, negligent medical treatment etc.